



# Current state of Asbestos Science

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**Asbestos Site Evaluation, Communication and Cleanup**

Keystone, Colorado  
September 22—26, 2003



# New Knowledge – Fiber Diameter

- Fibers with a diameter of  $0.4\ \mu\text{m}$  are critical based on rat data
- Epidemiologic data suggest that fibers with diameter of  $0.5\ \mu\text{m}$  to  $0.7\ \mu\text{m}$  can reach the respiratory zone of the lungs
- There is some indication from epidemiologic data that fibers with a diameter as high as  $1.5\ \mu\text{m}$  can reach the respiratory zone of the lungs in mouth breathers
- Thus, fibers with a diameter of  $\leq 0.5\ \mu\text{m}$  to  $1.5\ \mu\text{m}$  are considered to be relevant as they can reach the respiratory zone of the lungs in humans





# New Knowledge – Fiber Length

- Inhalation of fibers longer than 10  $\mu\text{m}$  presents a considerably greater risk for lung cancer but the exact size cut-off for the length and magnitude of relative potency is uncertain
- There are two schools of thought about cancer toxicity of fibers  $<5 \mu\text{m}$  in length:
  - present a very low risk, possibly zero for cancer based on human data (?)
  - cause inflammation and may potentiate the pulmonary reaction to long fibers based on animal data and in vitro studies
- Fibers  $< 5 \mu\text{m}$  in length are causally associated with asbestosis and pleural plaques
- For mesothelioma, greater weight should be assigned to thinner fibers and fibers in the 5  $\mu\text{m}$  to 10  $\mu\text{m}$  in length range



# New Knowledge – Fiber Type Lung Cancer

- There are different opinions about the relative potency of chrysotile vs amphiboles for lung cancer based on epidemiologic data
- Some assert that amphiboles are 5 times more toxic than chrysotile for lung cancer
- Others assert that no real difference is observed in statistical analysis of epidemiologic data
- The additional review of epidemiologic data to identify other factors such as industry in which exposure occurred might shed some light



# New Knowledge – Fiber Type Mesothelioma

- It is becoming apparent that there are different relative carcinogenic potencies for different fiber types
- The available epidemiologic data provides compelling evidence that potency of amphiboles is at least two orders of magnitude greater than that of chrysotile (ATSDR)
- Time since first exposure is an important factor for occurrence of mesothelioma
- Duration and intensity of exposure is also found to be important in epidemiologic studies



# New Knowledge - Other Amphibole Fibers

- Currently there are no data available either in humans or in animals about the toxicity of other amphiboles (e. g., winchite and richterite)
- Other amphibole fibers with similar durability and dimension would be expected to result in similar pathogenicity
- Thus, it may be prudent to consider potency of currently regulated and unregulated amphiboles to be similar





# New Knowledge – Cleavage Fragments

- Data indicate that durability and dimension are critical to pulmonary pathogenesis
- There are little data directly addressing similarities and dissimilarities between the original fibers and cleavage fragments for pulmonary pathogenesis
- Evidence suggests that it is prudent at this time to assume equivalent potency for lung cancer in the absence of other information
- Similarly, evidence implies that for mesothelioma, thin diameter fibers and fibers  $>5\text{ }\mu\text{m}$  in length are found to be more important, thus, cleavage fragments that do not meet these criteria are not expected to contribute to the risk of mesothelioma

